Central Reference File
No. 0.73
X12.63
RECEIVED
APR 20 1951
RESEARCH
INTERMOUNTAIN

# Research Note

NORTHERN ROCKY MOUNTAIN
FOREST AND RANGE EXPERIMENT STATION

Missoula, Montana

No. 89 February 1951

## WHITE-TAILED DEER BROWSING ON PONDEROSA PINE PLANTATIONS

Lowell Adams
Biologist, Fish and Wildlife Service 1/

White-tailed deer frequently interfere with attempts at reforestation of ponderosa pine by browsing on planted seedlings. The distributional pattern of winter deer ranges in northwestern Montana often coincides with ponderosa pine habitat. Thus the pine plantations are subject to deer depredations during winters when the deer forage supply is most critical.

In 1946, officials of the Kootenai National Forest initiated an experiment to measure the extent of deer browsing on planted pine seedlings. 2/ This experiment was needed as a demonstration that deer do eat pine seedlings, as a measure of the extent of the damage, and as a study of the role of the pine in the deer diet.

### The experiment

The experiment consisted of seven paired rectangular study plots one rod by two rods in size. One plot in each pair was fenced to exclude deer. Three of the pairs of plots were located on Cow Creek and four on Richards Creek, in the Fisher River watershed. Twenty-four 1-2 pine transplants were planted on each plot on October 18, 1946. A record was kept of browsing and destruction by deer.

---

1/ In cooperation with the Northern Rocky Mountain Forest and Range Experiment Station.

2/ Many individuals and agencies contributed in large measure to the experiment. Karl Klehm, former Forest Supervisor, Kootenai National Forest, initiated the experiment. His successor, William G. Guernsey, contributed active interest and assistance to the experiment. The present Supervisor, Howard E. Ahlskog, has supported the project since its inception when he was Staff Assistant on the Kootenai National Forest. Other staff men and Forest officials have contributed in many ways. District Rangers George R. Wolstad and Thurman H. Trosper, and Alternate Ranger Harvey Shelley have established plots, planted seedlings, maintained fences and helped with the annual surveys. The Montana State Fish and Game Department furnished fence material. State Biologists Jack Schmautz and Ade Zajanc have assisted with the annual surveys. R. K. LeBarron, Northern Rocky Mountain Forest and Range Experiment Station, assisted in designing the experiment. Professor Melvin Morris and students of the Montana State University School of Forestry assisted with some of the annual surveys.

INT - FILE COPY

## Results of the experiment

In the winter of 1946-47, utilization of the plants was found to be greatly influenced by snow conditions plus seasonal browse preference of the deer. Following planting, the trees remained unbrowsed for several months. The early period of nonuse may be attributed to the fact that the deer were utilizing other browse that had developed on the winter range during the previous summer. In a few weeks after planting, the plantations were covered with snow and this probably prevented browsing as long as the snow lasted.

In late January, 1947, recession of the snow left some of the seedlings exposed, and immediately deer began to eat them. On February 5, parts of two unfenced plots on Cow Creek were nearly bare of snow and had sustained considerable damage. On Plot 2-B 3/, 17 plants were browsed, 2 were trampled, and 5 were still under snow. On Plot 3-B, 14 plants were browsed, 1 was trampled, 6 were undamaged, and 3 were still under snow. This was at a time before new spring growth had started on other deer forage plants and the deer were still subsisting on winter forage. Some of the plots, particularly Plots 4-B and 7-B on Richards Creek, retained their snow mantles until late winter. These were relatively undamaged by deer. Apparently the deer had turned to new spring browse before the later-melting snows left these plots.

The extent of damage to pine plantations, as revealed by a survey on April 19, 1947, is shown in table 1. Over half of the plants were killed or browsed heavily (50-99 percent). About 40 percent were not damaged.

Table 1.--Extent of browsing damage to trees on unfenced ponderosa pine plantations on the Fisher River, 1947

| Plot | Occurrence of browsing by classes | | | | Total |
|---|---|---|---|---|---|
| | Undamaged | 1-49 percent | 50-99 percent | Dead | |
| | (Number) | (Number) | (Number) | (Number) | (Number) |
| 1-B | 2 | 0 | 13 | 9 | 24 |
| 2-B | 2 | 0 | 7 | 15 | 24 |
| 3-B | 2 | 0 | 5 | 17 | 24 |
| 4-B | 21 | 0 | 1 | 1 | 23 1/ |
| 5-B | 13 | 0 | 10 | 1 | 24 |
| 6-B | 3 | 0 | 1 | 20 | 24 |
| 7-B | 24 | 0 | 0 | 0 | 24 |
| Total | 67 | 0 | 37 | 63 | 167 |
| Percent of total | 40.1 | 0 | 22.2 | 37.7 | 100.0 |

1/ One plant dead of cause other than deer damage.

3/ Plot-pairs are numbered consecutively from 1 to 7. The fenced member of a pair is designated by an "A" after the number, the unfenced member by a "B". Thus, Plot 2-B is the unfenced plot of pair number 2. Cow Creek plots are numbered 1-3, Richards Creek plots, 4-7.

In the fall of 1947, all damaged seedlings of the 1946 planting were replaced with new plants. In April, 1948, the plots were again surveyed for evidence of damage. Results (table 2) show that the damage was more severe than it had been the previous year. About 86 percent of the plants were killed or heavily browsed. The rest were unbrowsed (12.5 percent) or but slightly browsed (1.2 percent). This heavier utilization is correlated with the lighter snowfall which occurred during the winter of 1947-48. Presumably (though no observations were made) the light snowpack melted from all plots earlier in the spring. Thus the plants were accessible to deer at the critical period before spring browse became available.

Table 2.--Extent of damage on unfenced ponderosa pine plantations on Fisher River, 1948

| Plot | Occurrence of browsing by classes | | | | Total |
|---|---|---|---|---|---|
| | Undamaged | 1-49 percent | 50-99 percent | Dead | |
| | (Number) | (Number) | (Number) | (Number) | (Number) |
| 1-B | 0 | 0 | 0 | 24 | 24 |
| 2-B | 0 | 1 | 3 | 20 | 24 |
| 3-B | 3 | 0 | 1 | 20 | 24 |
| 4-B | 5 | 0 | 10 | 9 | 24 |
| 5-B | 4 | 0 | 9 | 11 | 24 |
| 6-B | 4 | 0 | 4 | 16 | 24 |
| 7-B | 5 | 1 | 8 | 10 | 24 |
| Total | 21 | 2 | 35 | 110 | 168 |
| Percent of total | 12.5 | 1.2 | 20.8 | 65.5 | 100.0 |

The damage increase was markedly greater at Richards Creek than at Cow Creek (table 3). This is in keeping with the theory of interaction of snow and seasonal browse preference. On Cow Creek, most of the snow left early, even after the severe winter of 1946-47. On Richards Creek, most of the plots retained the heavy snows of 1946-47 through the critical late-winter period, but lost it after the lighter snowfall in 1947-48.

Table 3.--Plants heavily browsed and killed on Cow Creek and Richards Creek in 1947 and 1948

| Cow Creek | | | Richards Creek | | |
|---|---|---|---|---|---|
| Plot | 1947 | 1948 | Plot | 1947 | 1948 |
| 1-B | 22 | 24 | 4-B | 2 | 19 |
| 2-B | 22 | 23 | 5-B | 11 | 20 |
| 3-B | 22 | 21 | 6-B | 21 | 20 |
| | | | 7-B | 0 | 18 |
| Total | 66 | 68 | Total | 34 | 77 |

No more trees were planted after 1947, but surveys were continued each spring to observe the fate of remaining plants. Each year, through 1950, more trees were killed by deer (table 4). Mortality increased from 65.5 percent in 1948 to 88.7 percent in 1950. The percentage of undamaged trees decreased from 12.5 in 1948 to 1.2 in 1950. These figures would indicate a plantation failure if applied to a practical-scale planting project.

Table 4.--Percentage of trees in the various damage classes, 1947 to 1950 inclusive (unfenced plots) 1/

| Year | Occurrence of browsing by classes | | | | Total |
|---|---|---|---|---|---|
| | Undamaged | 1-49 percent | 50-99 percent | Dead | |
| 1947 | 40.1 | 0.0 | 22.2 | 37.7 | 100.0 |
| 1948 | 12.5 | 1.2 | 20.8 | 65.5 | 100.0 |
| 1949 | 1.8 | 6.0 | 12.5 | 79.8 | 100.0 |
| 1950 | 1.2 | 0.0 | 10.1 | 88.7 | 100.0 |

1/ Dead and damaged plants were replaced with new stock in fall, 1947.

The planted trees on the fenced plots showed comparatively good survival. There was some breakage of fences by deer and falling trees which allowed the deer to browse on these check plots. Table 5 shows the percentage of trees in the fenced plots variously damaged by deer. Figures in this table may be compared directly, year by year, with those from unfenced plots in table 4. Death on fenced plots from causes other than deer damage was limited to only three trees in all of the plots.

Table 5.--Percentage of trees in the various damage classes, 1947 to 1950 inclusive (fenced plots)

| Year | Occurrence of browsing by classes | | | | Total |
|---|---|---|---|---|---|
| | Undamaged | 1-49 percent | 50-99 percent | Dead | |
| 1947 | 100.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| 1948 | 80.3 | 4.6 | 11.6 | 3.5 | 100.0 |
| 1949 | 69.0 | 7.7 | 4.2 | 19.0 | 100.0 |
| 1950 | 43.9 | 12.1 | 10.4 | 33.5 | 100.0 |

Many of the seedlings that were killed by browsing disappeared and left no traces. In 1950, only three and a half years after planting, 50 out of 58 dead trees had completely disappeared. These total disappearances of known individual plants

illustrate one of the difficulties of evaluating deer damage in the field by broad surveys like the one conducted in 1947. 4/ According to the observation on the study plots, each dead seedling found in the field represents only about one-seventh of the number that have actually been killed in the past three years. Deer may not have caused all of the injury which has been described. Cattle and horses graze in the drainage where the plots are located. However, it seems certain that deer have been the primary injurious agents.

The experiment described has answered the questions for which it was designed. It has been demonstrated that deer eat planted ponderosa pine seedlings to the extent of becoming a primary limiting factor in their survival. Additionally, there is evidence that the pine is to some extent an item of starvation diet. Presumably, any improvement in the condition of more palatable and more nutritious deer range plants would result in release of browsing pressure on the pine seedlings.

4/ Adams, Lowell. The effects of deer on conifer reproduction in northwestern Montana. Jour. Forestry 47(11). November 1949.